

REMARKS

Claims 1, 2, 6-15 and 17-25 currently stand rejected. Applicant has amended claims 1, 7, 8 and 17 herein. Applicant respectfully request reconsideration and withdrawal of the rejections based on the following remarks.

Claim Objections

The Examiner has objected to claim 1 as grammatically confusing. Applicant has amended claim 1 in accordance with the Examiner's suggestion to remedy this objection. Applicant submits that claim 1 is in condition for allowance and respectfully requests the withdrawal of the objection.

Drawings and Specification

The Office action has objected to the drawings under 37 C.F.R 1.83(a). Applicant has corrected Figure 2 and Figure 4a and submits herein replacement drawings. A sensor 81 is included in the figures. Applicant has amended paragraphs [0039] and [0044] to include the element number "81" to the description of the sensor. Applicant submits that no new matter has been added to the drawings or specification and there is ample support of such a sensor in the specification. Applicant submits that the drawings are in compliance with Rule 1.83(a) and respectfully requests withdrawal of the objection.

Applicant's Invention

Applicant's invention is directed to a substrate processing system including first and second robotic arms for capturing and releasing a semiconductor wafer and an interleaf, respectively. The processing systems involved with semiconductor wafers are complex. Not only do the semiconductor wafers require extreme sensitivity when handling, but also the interleaf sheets are also generally extremely thin and flexible, making handling and proximity detection difficult. In order to address the difficulties in handling an interleaf, the second robotic arm of the

claimed system includes an end effector which applies both positive pressure and vacuum pressure to capture and release the interleaves. A sensor is further used to detect changes in pressure and signal the end effector to reduce the positive pressure.

The Cited Prior Art

U.S. Patent No. 4,784,380 (Eberle)

Eberle discloses an apparatus for automatically stacking battery plates and separators. The plates and separators are arranged in respective chutes for access by pivotably mounted vacuum pickup heads, which cycle between the chutes and the conveyor belt. The vacuum pickup heads capture the topmost elements in the chutes irrespective of the height at which the plates and separators may be stacked therein. Positive pressure is exerted through a central chamber of the pickup onto the top layer of the plates in order to aid in attachment of the plate. Suction is simultaneously applied and as the plate is sealed against the suction cup of the pickup, the plate actuates a button physically closing off the orifice from which the positive pressure is supplied.

Japanese Patent No. 11163091 (Ichikawa)

Ichikawa, as can be understood from its English abstract, discloses independent robots for transferring semiconductor wafer and sheets.

U.S. Patent No. 3,993,301 (Vits)

The Vits patent is directed to an apparatus for lifting a top sheet of material from a stack of material, the apparatus including a generally flat foot member interfacing the top sheet of the stack. The flat foot member has an arcuately shaped channel cutout on its surface, the channel being in gaseous communication with an internal conduit connected to a source of gas under pressure. The arc shaped slot on the flat foot member emits air radially from the arc in order to aid the flat foot member in capturing a top sheet of material in a stack of material. It is unclear with what type of sheets Vits is designed to be used.

Rejections Under 35 U.S.C. § 112

The Examiner has rejected claim 1 under 35 U.S.C. § 112, first paragraph and second paragraph, for lack of enablement and indefiniteness of a “sensor to detect proximity and engagement.” The Office action notes that the specification does enable a proximity sensor and an engagement sensor separately, but not as one sensor. Applicant respectfully submits there is ample support to enable one of ordinary skill in the art to make the invention as claimed, and thus requests reconsideration of this rejection.

Applicant points the Examiner to paragraph 0008 which states, “In another embodiment, the end effector of the system is configured to apply variable pressure forces to capture and release the interleaf. In another embodiment, the end effector of the system is configured to sequentially apply negative and positive pressures to capture and release the interleaf. In another embodiment, the system further includes a sensor to detect a proximity and engagement of the interleaf with the end effector. In still another embodiment the sensor uses differential pressure, reflectance, imaging, capacitance or inductance to detect proximity and engagement of the interleaf” (emphasis added).

As further enabling language, the specification states (para. 0039),

“a sensor 81 is used to detect a change in the vacuum applied at the interleaf end effector 80. Therefore, during operation, as the interleaf end effector 80 is lowered towards the interleaf sheets 30, a detected change of a certain magnitude in a vacuum pressure level is recognized as indicating that the interleaf end effector 80 has contacted a top interleaf 30 in the stack. This detected change in vacuum causes an interrupt at the system computer, which, in turn, causes the system computer to raise the end effector 80 away from the interleaf stack 30, and permit the transfer arm 40 to retrieve and retain only one interleaf sheet 30. In this way, the vacuum change prevents the end effector 80 from pressing the interleaf sheets 30 together and minimizes the development of an electrostatic bond between multiple interleaf sheets 30.”

Further, as disclosed in paragraph 0044 (as presently amended), “When the interleaf sheet 30 reaches and engages the diffuser 110, a sensor 81 determines a reduction in pressure to the

transfer arm 40 and the system 10 next applies a vacuum to the interleaf sheet 30 to secure the interleaf sheet to the end effector 80 for transport.”

Applicant respectfully submits that the specification and claims enable a person of ordinary skill in the art to make and use the invention commensurate with the scope of the claims. Applicant respectfully requests withdrawal of the rejection.

Rejections Under 35 U.S.C. § 103

Claims 1, 6, 7, 8 and 12-14 have been rejected under 35 U.S.C. § 103 as being unpatentable over Ichikawa in view of Eberle. Applicant respectfully traverses the rejection and requests reconsideration and withdrawal of the rejection.

As the Office action states, Ichikawa does not disclose applying positive pressure to an interleaf surface facing an end effector or a sensor to detect proximity and engagement. The Examiner maintains that one skilled in the art would find the claimed invention an obvious combination of the vacuum pickup of Eberle, in which positive pressure is supplied through a central orifice of the pickup simultaneously with a vacuum, and with the system of Ichikawa.

Applicant respectfully submits that the Examiner has misinterpreted the claimed invention and cited references. The Eberle device supplies positive pressure to the top surface of an element through a central channel 34 and out an orifice 12. When the top element 49a becomes attached to the suction cup 28, the element 49 as it is lifted by the vacuum presses a button 37 in the center of the pickup. As the element rises it presses the button 37 flush with the orifice 12 thereby ceasing all flow of positive pressure to the stack of elements. *See* col. 8, ll. 41-45, Figs. 7A-7C. There is no sensor for determining a reduction in said positive pressure.

According to claim 1 as currently amended, the end effector includes a “sensor to detect a proximity and engagement of the interleaf with the end effector, the sensor for determining a reduction in said positive pressure.” The positive pressure in Eberle is entirely eliminated by the

physical pressing of the central button 37 upward against the orifice 12 by the top element 49 being vacuumed by the applied suction force. There is no sensor to detect proximity and engagement of the interleaf with the end effector for determining a reduction in positive pressure – the positive pressure in Eberle is reduced by a mechanical actuation of the button caused by the vacuum pulling up the top element to seal the air flow, not as a result of a sensor detecting a reduction in pressure..

Applicant respectfully submits that the Office action has not stated a prima facie case of obviousness, as not every feature of claim 1 can be found in the cited references alone or in combination. Additionally, notwithstanding the deficiencies of the references cited, Applicant submits that the Office action points to no evidence, teaching or suggestion, or any other reason, that one skilled in the art would combine the teachings of these two references to solve the problem presented in the present application.

Applicant submits that claims 6-8 and 12-14 are also in condition for allowance as they depend from claim 1 and contain all of the elements of claim 1. Reconsideration is requested of the rejection of claims 1, 6, 7, 8 and 12-14 as defining subject matter that would have been obvious over Ichikawa in view of Eberle.

Claims 15, 17 and 27 stand rejected under 35 U.S.C. § 103 as being unpatentable over Ichikawa in view of Vits and Petvai. The Examiner combines the system of Ichikawa with the counterweight of Petvai and the application of positive pressure of Vits. Applicant traverses the rejection and respectfully requests reconsideration and withdrawal of the rejection.

None of the cited references discloses a pneumatic separator for separation of the interleafs, wherein the pneumatic separator is actuated in sequence with the end effector to facilitate capturing of an interleaf as claimed in independent claim 15. The Office action states that Vits discloses “a pneumatic separator where pneumatic is commonly known as air.”

Applicant respectfully disagrees with the Examiner's assertion. A pneumatic separator, as claimed, is a physical structure from which air is output facilitating the capture of an interleaf. Claim 15 states "the pneumatic separator is actuated in sequence with the end effector to facilitate the capturing of the interleaf." The Examiner's interpretation that "air" is actuated in sequence with the end effector is illogical and confusing. Applicant submits that the proper interpretation of "pneumatic separator," among other features distinguishes claim 15 from the cited references.

Applicant submits that claims 17 and 27 are also in condition for allowance as they depend from claim 15 and contain all of the elements of claim 15. Reconsideration is requested of the rejection of claims 17 and 27 as defining subject matter that would have been obvious over Ichikawa in view of Vits and Petvai.


Conclusion

In light of the foregoing amendments and remarks, Applicant believes all objections and rejections have been overcome and all claims are patentably distinguishable from the cited references. Applicant respectfully submits the application is in condition for allowance, and such action is respectfully requested.

Respectfully submitted,

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